WHAT IS CLAIMED IS:

1. A control system for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor, a drive unit interconnecting said motor with a door, and an electrically operated brake operably connected to said drive motor and said drive unit for braking rotation of an output shaft of said drive unit, said control system comprising:

a programmable microcontroller operable to receive control signals from at least one of plural switches for providing door open, door close and door stop signals, and a single switch for sequentially providing door open, door close and door stop signals;

a motor power supply control circuit for operating said drive motor in reverse directions of rotation;

a motor drive circuit including motor relay actuator means, said motor drive circuit being adapted to receive control signals from said microcontroller to effect operation of said drive motor through said motor power supply control circuit to provide for one of opening and closing said door; and

a brake control circuit operably connected to said microcontroller and operable to provide signals for releasing said brake and for progressively applying said brake to brake rotation of said output shaft.

2. The control system set forth in Claim 1 wherein:

said brake control circuit is operably connected to said motor drive circuit for releasing said brake substantially simultaneously with energizing said drive motor through said motor drive circuit.

3. The control system set forth in Claim 1 wherein:

said motor drive circuit includes at least two motor interlock relays in circuit with motor drive relay actuators, respectively, said motor interlock relays being operable to prevent energization of one of said motor drive relay actuators when the other of said motor drive relay actuators is energized to rotate said drive motor in a selected direction to one of open and close said door.

4. The control system set forth in Claim 3 including:

a motor drive status feedback circuit operably connected to said motor drive circuit and operable to receive a signal from said motor drive circuit when one or the other of said motor drive relay actuators and an associated motor interlock relay are energized to provide a feedback signal to said microcontroller.

5. The control system set forth in Claim 4 including:

a motor watchdog circuit operably connected to said motor drive circuit and including a switch connected to said motor drive circuit and to means for receiving a signal from said microcontroller, said means being operable in response to not receiving a signal from said microcontroller to effect shutdown of said drive motor.

6. The control system set forth in Claim 5 wherein:

said motor watchdog circuit is operably connected to said brake control circuit to prevent release of said brake when said microcontroller is inoperative.

7. The control system set forth in Claim 1 including:

a brake release feedback circuit operably connected between said brake control circuit and said microcontroller for providing a brake status feedback signal to said microcontroller.

8. The control system set forth in Claim 1 including:

door position limit indicator means for indicating when said door has reached an open position and a closed position, respectively, circuit means connected to said door position limit indicator means and said microcontroller for providing input signals to said microcontroller to indicate when said door has reached an open limit position and a closed limit position, respectively.

9. The control system set forth in Claim 1 including:

a power supply circuit for said control system including connector means for connecting said control system to a power source, a converter circuit for converting AC line voltage to low voltage DC power and a voltage sensing circuit operably connected to said power supply circuit and operable to effect interruption of power to said control system.

10. The control system set forth in Claim 9 including:

an emergency shutdown circuit interconnected between said voltage sensing circuit and said microcontroller and operable upon receiving an output signal from said microcontroller to effect operation of said voltage sensing circuit to effect interruption of power to said control system.

11. The control system set forth in Claim 1 including:

a door reverse control circuit adapted to be connected to a device for providing a signal to effect reversing the direction of movement of said door when said door is moving toward a closed position, said reverse control circuit being operable to provide an input signal to said microcontroller to effect operation of said operator unit to stop movement of said door toward a closed position and effect operation of said operator unit to move said door to an open position.

12. The control system set forth in Claim 1 including:

a keypad operably connected to said microcontroller and to a decoder circuit by way of a keypad driver circuit for providing calibration of a selected function controlled by said microcontroller including at least one of a door limit position overrun time delay, a progressive braking rate for applying braking action by said brake assembly to stop rotation of said output shaft, a mid-stop setting for arresting movement of said door between its open and closed positions, a maximum run time of said operator unit to at least one open and close said door, and deenergizing said drive motor for a predetermined time commencing with deenergization of said motor.

13. The control system set forth in Claim 12 wherein:

said control system is mounted in an enclosure and is operably connected to said motor, said drive unit and said brake by connector means whereby said enclosure may be selectively mounted on said operator unit and remote from said operator unit.

14. A control system for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor, and a drive unit interconnecting said motor with a door, said control system comprising:

a programmable microcontroller operable to receive control signals from at least one of plural switches for providing door open, door close and door stop signals, and a single switch for sequentially providing door open, door close and door stop signals;

a motor power supply control circuit for operating said drive motor in reverse directions of rotation;

a motor drive circuit including motor relay actuator means, said motor drive circuit being adapted to receive control signals from said microcontroller to effect operation of said drive motor through said motor power supply control circuit to provide for one of opening and closing said door; and

a motor watchdog circuit operably connected to said motor drive circuit and including a switch connected to said motor drive circuit and to means for receiving a signal from said microcontroller, said means being operable in response to the absence of a predetermined signal from said microcontroller to effect shutdown of said drive motor.

15. The control system set forth in Claim 14 wherein:

said motor drive circuit includes at least two motor interlock relays in circuit with motor drive relay actuators, respectively, said motor interlock relays being operable to prevent energization of one of said motor drive relay actuators when the other of said motor drive relay actuators is energized to rotate said drive motor in a selected direction to one of open and close said door.

16. The control system set forth in Claim 15 including:

a motor drive status feedback circuit operably connected to said motor drive circuit and operable to receive a signal from said motor drive circuit when one or the other of said motor drive relay actuators and an associated motor interlock relay are energized to provide a feedback signal to said microcontroller.

17. The control system set forth in Claim 14 including:

an electrically operated brake operably connected to said drive unit for braking rotation of an output shaft of said drive unit, a brake control circuit operably connected to said microcontroller for releasing said brake, and said motor watchdog circuit is operably connected to said brake release circuit to prevent release of said brake in the absence of said predetermined signal from said microcontroller.

18. The control system set forth in Claim 17 including:

a brake release feedback circuit operably connected between said brake release circuit and said microcontroller for providing a brake status feedback signal to said microcontroller.

19. The control system set forth in Claim 14 including:

a power supply circuit for said control system including connector means for connecting said control system to a power source, a converter circuit for converting AC line voltage to low voltage DC power and a voltage sensing circuit operably connected to said power supply circuit and operable to effect interruption of power to said control system.

20. The control system set forth in Claim 19 including:

an emergency shutdown circuit interconnected between said voltage sensing circuit and said microcontroller and operable upon receiving an output signal from said microcontroller to effect operation of said voltage sensing circuit to effect interruption of power to said control system.

21. A control system for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor, a drive unit interconnecting said motor with a door, and an electrically operated brake operably connected to said drive motor and said drive unit for braking rotation of an output shaft of said drive unit, said control system comprising:

a programmable microcontroller operable to receive door open, door close and door stop signals and to provide control signals to a motor drive circuit;

a motor power supply control circuit for operating said drive motor in reverse directions of rotation;

a motor drive circuit adapted to receive control signals from said microcontroller to effect operation of said drive motor through said motor power supply control circuit to provide for one of opening and closing said door;

a brake control circuit operably connected to said microcontroller and operable to control engagement and release of said brake; and

a keypad operably connected to said microcontroller for providing calibration of a selected function controlled by said microcontroller including at least one of a door limit position overrun time delay, a progressive braking rate for applying braking action by said brake to stop rotation of said output shaft, a mid-stop setting for arresting movement of said door between its open and closed positions, a maximum run time of said operator unit to provide at least one of opening and closing said door, and deenergizing said drive motor for a predetermined time commencing with deenergization of said drive motor.

22. The control system set forth in Claim 21 including:

a visual display operably connected to said microcontroller for displaying a selected condition code in an operating mode of said control system and calibration information when said control system is in a calibration mode.

23. The control system set forth in Claim 22 including:

a memory operably connected to said microcontroller and operable to store signals related to multiple error codes for recall and display on said visual display.

24. The control system set forth in Claim 21 wherein:

said microcontroller includes timer means for automatically setting said maximum run time of said operator unit between said open and closed positions based on a measured run time of said door between said open and closed positions plus an additional increment of time.

25. The control system set forth in Claim 21 including:

a connector for connecting a device to said control system to retrieve data stored in a memory operably connected to said microcontroller and to at least one of perform specific tests and monitor functions related to the operation of said control system.

26. In a control system for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor, a drive unit interconnecting said motor with a door, an electrically operated brake operably connected to said motor and said drive unit for braking rotation of an output shaft of said drive unit, and door position indicator means associated with said operator unit, said control system comprising a motor power supply control circuit, a programmable microcontroller operable to receive door open, door close and door stop signals and to provide control signals to a motor drive circuit, and a brake control circuit, the improvement comprising:

a housing adapted to be detachably connected to said operator unit and including said microcontroller, said motor power supply control circuit and said brake control circuit and plural connectors disposed in said housing for interconnecting said operator unit with said control system and adapted to provide for mounting said housing at a location remote from said operator unit while remaining operably connected to said operator unit through conductor means extending between said housing and said motor, said indicator means and said brake.

27. The invention set forth in Claim 26 wherein:

said power supply control circuit includes a plurality of relay contactors adapted to be connected to a source of electric power at selected voltages and plural connectors connected to said power supply control circuit for connecting said control system to said motor depending on a voltage and phase requirement for driving said motor.

28. A method for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor, a drive unit interconnecting said motor with a door and an electrically operated brake operably connected to said drive unit for braking rotation of an output shaft of said drive unit, said control system including a programmable microcontroller operably connected to means for providing door position limit signals to said microcontroller, said method comprising the steps of:

moving said door toward one of an open and closed limit position by energizing said motor and releasing said brake; and

upon said door approaching one of said open and closed position, deenergizing said motor at a selected overrun time delay after receiving a door limit position signal by said microcontroller.

29. The method set forth in Claim 28 including the step of:

providing a calibration circuit operably connected to said microcontroller; and

selecting a value of overrun time delay by way of said calibration circuit to provide a selected time delay between receipt of a limit position signal by said microcontroller and onset of applying a signal to effect operation of said brake to brake rotation of said output shaft.

30. The method set forth in Claim 29 including the step of:

preventing said door from moving toward an open position during said period of over run time delay and during operation of said brake when said door is approaching said closed position.

31. The method set forth in Claim 28 including the step of:

initiating a braking procedure with said brake in response to a door limit position signal received by said microcontroller.

32. The method set forth in Claim 30 wherein:

said braking procedure comprises deenergizing a brake operator of said brake to provide braking of said output shaft by applying a pulse width modulated signal to said brake operator, and progressively reducing a duty cycle of said modulated signal applied to said brake operator to halt rotation of said output shaft.

33. The method set forth in Claim 32 including the step of:

providing a signal to said brake operator from a predetermined set of braking rate signals stored in said microcontroller by selecting one of said braking rate signals at will.

34. The method set forth in Claim 28 including the step of:

causing said microcontroller to effect arresting movement of said door in a position between an open limit position and a closed limit position after a predetermined time which commences with movement of said door from one of said limit positions toward the other of said limit positions.

35. The method set forth in Claim 34 wherein:

said control system is operated to cause said door to stop in a position between said limit positions after a predetermined time commencing with movement of said door from a closed limit position of said door.

36. The method set forth in Claim 28 including the step of:

causing said microcontroller to effect shutoff of said motor after a predetermined time commencing with movement of said door away from one of said open and closed limit positions.

37. The method set forth in Claim 28 including the step of:

causing said microcontroller to not respond to a signal to effect one of opening and closing said door for a predetermined time commencing with deenergization of said motor to halt movement of said door.

38. A method for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor, a drive unit interconnecting said motor with a door, an electrically operated brake operably connected to said drive unit for braking rotation of an output shaft of said drive unit, and a control system including a programmable microcontroller operably connected to means for providing door position limit signals to said microcontroller, said method comprising the steps of:

moving said door toward one of an open and closed limit position by energizing said motor and releasing said brake; and

upon said door approaching one of said open and closed position, causing a brake operator of said brake to progressively brake rotation of said output shaft.

39. The method set forth in Claim 38 wherein:

said brake operator is controlled to progressively brake rotation of said output shaft by applying a pulse width modulated signal to said brake operator, and reducing a duty cycle of said modulated signal applied to said brake operator in preset steps at selected time intervals to halt rotation of said output shaft.

40. The method set forth in Claim 39 including the step of:

providing a calibration circuit operably connected to said microcontroller; and

selecting values of duty cycle and time interval by way of said calibration circuit to effect operation of said brake.

41. A method for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor, a drive unit interconnecting said motor with a door, an electrically operated brake operably connected to said drive unit for braking rotation of an output shaft of said drive unit, and a control system including a programmable microcontroller operably connected to means for providing door position limit signals to said microcontroller, said method comprising the steps of:

moving said door toward one of an open and closed limit position by energizing said motor and releasing said brake; and

causing said microcontroller to effect arresting movement of said door in a position between an open limit position and a closed limit position after a first predetermined time which is automatically set by said microcontroller and commences with movement of said door from one of said limit positions toward the other of said limit positions.

42. The method set forth in Claim 41 wherein:

said control system is operated to cause said door to stop in a position between said limit positions after said first predetermined time commencing with movement of said door from a closed limit position of said door.

43. The method set forth in Claim 41 including the step of:

causing said microcontroller to not respond to a signal to effect one of opening and closing said door for a predetermined time commencing with deenergization of said motor to halt movement of said door.

44. The method set forth in Claim 41 including the step of:

determining said first predetermined time by measuring a second time period which comprises the time required to move said door between said open and closed positions and adding a third predetermined time period to said second time period to provide said first predetermined time.

45. A method for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor having a rotatable output shaft, a drive unit including an electrically actuated brake interconnecting said motor with a door and a control system including a programmable microcontroller including a memory, a keypad for providing information to said microcontroller and a visual display for displaying a condition code and calibration information associated with operation of said operator unit, said method including the step of:

using said keypad to select one of a door open mode of operation, a door close mode of operation, a calibration mode and selection of available calibration functions.

46. The method set forth in Claim 45 including the step of:

setting at least one predetermined value of braking rate with said keypad.

47. The method set forth in Claim 45 including the steps of:

providing said operator unit with a control switch for providing a signal to said control system to energize said motor and deenergize said motor; and

using said keypad to cause said control system to require one of constant contact of said switch and momentary contact of said switch, respectively.

48. The method set forth in Claim 45 including the step of:

causing said visual display to display selected error codes associated with a fault condition of said operator unit and said control system, respectively.

49. The method set forth in Claim 45 including the step of:

using said keypad to enter a value of time delay between said door reaching a one of said positions and onset of a braking procedure for arresting operation of said operator unit.

50. The method set forth in Claim 45 including the step of:

using said keypad to select a time delay associated with a midstop limit position of said door between said open and closed positions.

51. The method set forth in Claim 45 including the step of:

using said keypad to clear a maximum run time of said motor.

52. The method set forth in Claim 45 including the steps of:

using said keypad and said visual display to select a direction of rotation of said output shaft equivalent to a given direction of travel of said door.

53. The method set forth in Claim 45 including the steps of:

using said keypad to select at least one of a direction of output shaft rotation of said operator unit corresponding to a given direction of door travel and controlling direction sensitive input commands to said control system.

54. A method for controlling the operation of a door operator unit to move a door between open and closed positions, said operator unit including a reversible electric drive motor having a rotatable output shaft, a drive unit interconnecting said motor with a door and a control system including a programmable microcontroller including a memory, a keypad for providing information to said microcontroller and a visual display for displaying information associated with operation of said operator unit, said method including the step of:

causing said visual display to display one of a fault code and a condition code of said operator unit.

55. The method set forth in Claim 54 including the step of:

causing said visual display to display selected error codes associated with a fault condition of said operator unit and said control system, respectively.